Housing conditions and ill health

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Abstract

Lack of empirical evidence that living in damp houses has detrimental effects on health may partly be due to inadequate research. A preliminary study was therefore carried out of a random sample of council owned residences in a deprived area of Edinburgh, a respondent from consenting households being interviewed to obtain a profile of the physical and mental health of all adults and children. In addition, information was gathered about other factors that might be important, particularly smoking and selective bias in the allocation of tenants to houses. Independent measures of dampness were made by environmental health officers.

No conclusive effects of damp on the health of adults were identified. Nevertheless, children living in damp houses, especially where fungal mould was present, had higher rates of respiratory symptoms, which were unrelated to smoking in the household, and higher rates of symptoms of infection and stress.

Housing should remain an important public health issue, and the effects of damp warrant further investigation.

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Introduction

The *BMJ* argued recently that the health implications of poverty, unemployment, and inadequate housing were not being emphasised strongly enough and made a plea for the formation of a public health alliance to highlight these issues.[1] Certainly, the role of housing conditions in the aetiology of illness appears to have received comparatively little attention since the decline of tuberculosis in the 1950s.

Most recent studies of housing conditions have concentrated on the relation between living in a damp house and respiratory complaints such as asthma[2] and wheeze.[3,4] Rising and penetrating damp provide the moist conditions conducive to germination of spores of mould fungi. Fungal spores, in turn, are believed to affect the respiratory tract by producing lesions in tissue, by forming saprophytic colonies on plugs of mucus, and by acting as allergens causing rhinitis, alveolitis, and asthma.[5,6] Some studies have suggested that ambient humidity influences the viability of viruses in droplet sprays.[7,8] The association between damp housing and health problems, however, is not clear cut, possibly being complicated by other factors known to affect health, such as smoking and poverty. A further serious flaw has been that the presence of damp has been reported by the householder or by the research team, casting doubt on the objectivity of the findings because of either the tenant's desire to get rehoused or bias in the experimenter.

This study was carried out in response to the concern of residents in a deprived area of Edinburgh about the possible effects of damp on their health. The preliminary study aimed at investigating the relation between damp housing and the physical and mental health of tenants and their children.

Edinburgh city is ringed by estates of council housing of varying quality and desirability, and the study area is regarded as one of the less (but by no means least) desirable in which to live (K Brown, unpublished master's dissertation, 1986). The area consists of

main tenement flats, constructed in the 1930s and 1960s, situated close to the Forth on low lying land exposed to winds.

Method

In order to overcome problems of bias in respondents or experimenters in reporting damp Edinburgh District Council's environmental health department agreed that an independent survey of dwellings would be carried out by environmental health officers. Assessments of damp and health were not linked until the data collection was complete; hence the study was double blind. The housing department made records available from which a random one in four sample of tenanted dwellings was drawn from the study area, which comprised one postcode sector of Edinburgh and contained just over 2000 dwellings. A duplicate list of the sample was given to the environmental health department for its own survey.

A questionnaire was drawn up and used in a pilot study in an area similar to that under investigation. The questionnaire focused on sociodemographic data, reports of symptoms and use of health services for all household members, smoking, household income, and heating type and costs. A standardised measure of perceived health problems, the Nottingham health profile,[*] was also included. At the end of the interview schedule the tenants' own assessment of whether the house was damp was elicited.

Between March and May 1986 a team of experienced interviewers visited tenants in their own homes. They were instructed to interview a woman if possible, as women tend to have more knowledge of the health problems of the family as a whole. During the same period the survey of sample dwellings was conducted by environmental health officers using protometers, which measure relative humidity and damp. This was supplemented by observation. For most analyses a composite measure of damp was derived from these assessments whereby any sign of damp—that is, damp, condensation, or fungal mould—was regarded as evidence of a "damp house." It was not possible from the information available to rate each house on a measure of severity of dampness.

Except where stated otherwise, all comparisons between damp and non-damp households were carried out by χ^2 test or Mann-Whitney U test. The significance level was set at 0·05, though we recognise that where multiple comparisons are made one in 20 may be significant by chance.

Results

A total of 358 interviews were completed, representing a response rate of 79%. The refusal rate was 12%, and 15% of the sample could not be contacted. Environmental health officers obtained information for 300 of these households. There were no differences in any of the main sociodemographic variables between those households for which we had full information and the 58 for which we did not. A total of 294 (82%) of the respondents were women. The age range was 19-91; 143 (40%) were aged under 45 and 150 (42%) aged over 60, which was representative of the community as a whole. Unemployment was high; in slightly fewer than half (45%) of the households where the respondent was below pensionable age there was no adult in paid employment. A third of all households were receiving supplementary benefit.

According to the independent assessments 73 (24%) of the dwellings were damp; 51 (17% of the total; 70% of the damp dwellings) had fungal mould.

Children's health in the previous two months. Except where stated otherwise figures are numbers (percentages) of children

	Damp houses (n=33)	Non-damp houses (n=68)
Median No of symptoms (range)	3 (0-8)	2 (0-10)**
Non-respiratory symptoms:		
Aches and pains	9 (27)	5 (7)*
Diarrhoea	11 (33)	9 (13)*
Vomiting	10 (30)	12 (18)
Nerves	7 (21)	2 (3)**
Tiredness	5 (15)	3 (4)
Headache	8 (24)	6 (9)*
Rash	9 (27)	17 (25)
Fever/temperature	8 (24)	13 (19)
Respiratory symptoms:		
Persistent cough	16 (48)	24 (35)
Phlegm	15 (45)	19 (28)
Wheeze	18 (55)	27 (40)
Sore throat	4 (12)	8 (12)
Earache	28 (85)	41 (60)**
Any respiratory symptom		

*p<0·05. **p<0·01.

The proportion of houses identified as damp, however, varied considerably by street. Almost 80% of the damp houses were concentrated in nine of the 26 streets surveyed. Most of the damp dwellings were built between 1930 and 1936.

More damp houses were overcrowded than dry ones (8 (11%) v 9 (4%); p<0·08). Tenants in damp houses were significantly younger (p<0·001) and more likely (p<0·05) to have children. In households with children, however, the number of children was similar in those that were damp (median 2, range 1-4) and non-damp (median 2, range 1-4). A greater proportion of respondents in damp houses had moved to their current homes because of previous poor housing (29 (40%) v 59 (26%); p<0·05). There were no differences between damp and non-damp households in respect of the duration of tenancy (47 (65%) v 157 (69%) tenants had lived in their present homes for five or more years); tenants having moved to their present homes for health reasons (10 (14%) v 23 (10%)); weekly household income (58 (79%) v 186 (82%) had a net weekly household income of less than £100); whether Calor gas fires were used for heating (15 (21%) v 41 (18%)); or smoking (45 (62%) v 127 (56%) households contained a current cigarette smoker).

HEALTH OF RESPONDENTS

The study sample as a whole appeared to be characterised by very poor health. During the previous two months 255 (85%) of the respondents reported at least one symptom or health problem (124 (41%) mentioning respiratory symptoms such as persistent cough, wheeze, or blocked nose), 120 (40%) had consulted their general practitioner, and two thirds had taken a prescribed or non-prescribed medicine; 168 (56%) reported a long term or recurrent health problem. There were, however, no significant differences between those living in damp and non-damp houses.

Nottingham health profile scores were generally high for the six areas of perceived problems (sleep, energy, pain, physical mobility, emotional reactions, and social support) suggesting raised levels of distress. The only significant difference, however, was for emotional reaction scores, which were higher for those in damp houses (p<0·05).

HEALTH OF CHILDREN

The table shows that defective housing was strongly associated with ill health among children, a third of whom were living in homes considered to be damp. The number of symptoms was higher in the damp houses (p<0·01) and there were significant differences for several symptoms: aches and pains, diarrhoea, "nerves," and headache. Though there were no significant differences in individual respiratory symptoms, children in damp houses were significantly more likely to have had at least one respiratory problem in the past two months (p<0·01).

Log linear analysis[**] was performed in order to rule out the possibility that the difference in incidence of respiratory problems was invalidated by the confounding effects of smoking and the presence of other children in the household. Cigarette smoking was not found to be associated with respiratory symptoms in children, but the more children living in the household the greater was the likelihood of such symptoms. More importantly, after controlling for number of children and smoking a significant main effect for dampness remained. There were no interactions between the independent variables. There was no association between the use of Calor gas and respiratory symptoms in children.

In a further analysis we compared children in "mouldy" (n=24) and "non-mouldy" (n=77) dwellings. In general, children in homes where mould was found had the higher symptom rates. Moreover, in addition to the significant associations listed in the table, rates of vomiting and sore throat were significantly higher in homes affected by mould than in other homes (10 (42%) v 12 (16%), p<0·01; and 16 (67%) v 29 (38%), p<0·05). In an attempt to explore the possibility of reporting bias (see below) we also examined the relation between the tenant's perception of whether or not the house was damp and reported symptoms. There were no significant differences for any symptom in either children or adults.

Discussion

This study found no clear evidence to support the hypothesis that damp housing has a detrimental effect on the physical health of adults; nevertheless, there was evidence that those living in damp houses had more emotional distress. The principal finding, however, was of significant associations between living in a damp and, more specifically, "mouldy" house and ill health among children. Not

only respiratory problems but other symptoms suggestive of infections and stress were more common in children in damp dwellings.

Respiratory problems may be due to the fact that the spores of many fungi act as allergens, sensitising mucous membranes and producing symptoms of wheezing, cough, fever, and general malaise in both atopic and non-atopic people.[11] Vomiting and diarrhoea in children in damp houses are harder to explain. Nevertheless, if mycotoxins in fungi were ingested their metabolites might give rise to the symptoms.[11] It seems probable that headache and "nerves" in the children may partly be related to the other symptoms or be a response to tension in the home; equally, however, they may be symptoms of emotional upset, possibly associated with recurrent symptoms, disruption of school and social activities, and the living conditions themselves.

Several studies have suggested an association between poor housing and health problems.[3-6] Acceptance of these findings and action on them, however, have been conspicuously absent, explanations including the financial and political implications of improving housing. At the scientific level most studies have been criticised on the grounds that the relation of ill health to poor housing could be confounded by other variables, such as low income, smoking, type of heating, overcrowding, housing allocation policies, and bias of experimenters or respondents, or both. This study, though based on fairly small numbers, has addressed such criticisms. It is plainly impossible to allow for all confounding factors; however, several alternative explanations of our findings appear to be unlikely.

Firstly, the sample was homogeneous with respect to social class and income. More than three quarters of respondents or their partners, or both, actually in employment were in manual occupations. Virtually all the households were on low incomes, and there were no income differences between those in damp and non-damp houses.

Secondly, the results show that certain aspects of the respondents' behaviour were not implicated. In particular, smoking made no contribution to children's respiratory symptoms. This is at variance with other studies,[7-9] but our sample was drawn from a social group with high rates of smoking,[10] and the adverse effects of parental smoking on children are largely confined to children under the age of 1 year.[10] Overcrowding and the number of children in the household were not contaminating factors; even after controlling for these factors significant effects for dampness remained. The use of Calor gas fires in the home was not associated with either dampness or children's respiratory symptoms. Indeed, that the damp houses were mostly confined to particular streets makes it unlikely that the tenants themselves created the conditions which gave rise to damp.

Thirdly, issues of self selection and bias in the allocation of tenants to dwellings must be addressed—that is, that the "sick" may be more likely to move into poor housing or be allocated the worst properties. For the most part council tenants have little choice about where they will live and, though the low desirability of the study area inevitably leads to some self selection, it is by no means the least desirable of the council housing schemes in and around Edinburgh. Families living in damp houses were more likely to have come from poor conditions, but they were not more likely to have moved for health reasons. It was children, not adults, with poor health who were more likely to be living in damp houses; there was no evidence that behaviour problems in children were a factor in the allocation of families to particular houses. The only clear selection bias operating appeared to be of the infirm elderly being allocated better housing. There were no significant differences between damp and non-damp households in the length of time tenants had lived in their homes, and most had lived in the same house for more than five years.

As in most surveys, information about respondents' and children's health was reported by the respondent. Physical examination of all household members was beyond the scope of this study. Inevitably this raises questions about the possibility of reporting bias. Differential overreporting by those in damp houses would be manifested in respondents' reports of their own as well as their children's health, but it was clear that health differences were confined to children. Perhaps even more importantly, respondents who reported their homes to be damp were not more likely to report symptoms either in themselves or in their children. The possibility of experimenter or respondent bias was minimised by having an independent survey of damp and not comparing data on dampness and health until the health data were coded.

Though it might be suggested that smokers may underreport symptoms such as coughing or wheezing, this was not the case in our study, where the highest rates of respiratory symptoms were found in heavy smokers. This, in turn, suggests that children's respiratory symptoms were not being underreported. Finally, there was no association between the respondents' mental state and the reporting of physical symptoms in children, suggesting that "psychologically distressed" mothers were not overreporting health problems in their children.

This study considered obvious confounding factors which might explain the findings and has gone a long way to ruling out selection and reporting biases. The findings appear to be robust and the association between living in a damp house and ill health in children cannot easily be attributed to other factors. Clearly, the number of households studied was fairly small and a larger investigation, using the same double blind methodology, is warranted and is being planned. If our findings are replicated the public health implications will require urgent consideration. Improvements in the health of the population in the past 100 years have largely been a consequence of improved living conditions and thus a healthier home environment.[21] The early exposure to an adverse living environment is likely to increase vulnerability to illness in later life—particularly to the chronic respiratory diseases,[22] which are still a main cause of morbidity and mortality in Britain.

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